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0002 5/55/006

October 30, 1998

TO: File

THRU: Daron Haddock, Permit Supervisor DRH

FROM: James D. Smith, Reclamation Specialist JDS

RE: Sunray Mineral Products SITLA lease, Sunray Mineral Products, INA/055/001, File 2, Wayne County, Utah.

SUMMARY

Humate is a commercially exploitable mineral that is currently mined in Utah and New Mexico, and possibly in other states. Currently active humate mines are regulated under mineral rather than coal mining rules in both Utah or New Mexico, and the BLM considers humate to be a saleable mineral similar to sand and gravel. Deposits of weathered coal and carboniferous shale located adjacent to the abandoned Factory Butte coal mine in Wayne County, Utah are similar to the humate deposits being mined in Emery County, Utah, and match descriptions of other humate deposits in Utah and New Mexico. Managing and permitting of the Wayne County deposits as humate, a non-coal mineral, would be technically sound and consistent with present state and federal policies and practices.

INTRODUCTION

Various names are applied to low-rank weathered coal, including "leonardite coal". Weathered coal is often rich in humic acid and related organic acids that give it value as a soil amendment. As used in soils chemistry, humate is the salt or ester of humic acid, and so some consider weathered coal to be distinct from humate (Siemers and Wadell, 1977). More commonly the word "humate" refers to a deposit containing abundant humic acid along with mineral components such as clay and silt. Humate deposits can include thin coals interbedded with humic shales. Coal seams as thick as three feet are included in strata at Harley Dome, Utah described as humate (Jackson, 1983).

Currently there are three operations mining humate deposits in Utah. The humate is a raw material used to produce a soil amendment and an ingredient added to certain dietary mineral supplements. These mining operations are regulated by the Minerals Section of UDOGM. Humates, both humic shales and weathered coals, have been mined in several states

for various uses such as soil amendments and micronutrient fertilizers, drilling fluid additives, binders, and stains (Siemers and Wadell, 1977: Hoffman and others, 1994). An expanding market for coal humate to be used as a soil amendment is anticipated by Sunray Minerals Corporation.

Several humate mining operations have been active in New Mexico over the past 15 to 20 years. They are regulated by the New Mexico Bureau of Mines and Mineral Resources under "hard rock" mining regulations. The material mined is described as humate or humic shale, not coal, and is marketed primarily as a soil amendment and drilling-mud additive (Hoffman and others, 1994). In early 1997 I talked by telephone with Jim O'Hara of the New Mexico Bureau of Mines and Mineral Resources and he told me there was one active humate mining operation in New Mexico at that time.

Utah Coal Mining rules (R645-100-200) define coal as "combustible, carbonaceous rock, classified as anthracite, bituminous, subbituminous, or lignite by ASTM Standard D388-77". ASTM Standard D388-77 was updated in 1995 to D388-95. A copy of Standard D388-77 could not be found but, as far as can be determined by using additional references, Btu values used to define coal rank have not been changed between D388-77 and D388-95. All three of Sunray Mineral's samples have Btu values below 6300 Btu/lb so fall into the lowest coal rank, lignite B. There is no minimum BTU value below which a material would not be considered coal by the ASTM standard.

However, the BLM primarily considers the intended use in determining whether to treat a material as humate or as coal, humate being material mined for some use other than as fuel (personal communications with Jim Kohler, Doug Bauer, and Max Nielsen of the Utah BLM office, and Bill Dalness of the New Mexico office). The USGS stated in a 1977 memo (see attached) that humate is low Btu material that is mined for uses other than as combustible fuel, and that humate deposits may include oxidized or weathered low-rank coal. The BLM manages humate deposits on Federal lands as a saleable mineral similar to sand and gravel, clay, and vegetal material, not as a leasable mineral such as coal; although in at least one case humate on federal land has been managed as a locatable mineral (Doug Bauer, personal communication). Dave Tabet, coal geologist for the UGS, has stated agreement that humate should not be considered coal because its end use is not as a fuel.

Humic acid-rich weathered coal deposits in New Mexico are described as extending no more than a few hundred feet into the subsurface from the outcrop (Siemers and Wadell, 1977), and a depth of 9 meters (30 feet) is typically used as maximum depth for significant weathering of coal (Hoffman and others, 1966).

FIELD INVESTIGATION

On October 8, 1998 Jim Smith and Tony Gallegos of UDOGM and John Blake of Utah School and Institutional Trust Lands Administration (SITLA) visited the Rockland Corporation humate mine and the Clark #1 and Cowboy leases in Emery County. Later the same day they went to the site of a proposed humate mine on the SITLA clay lease in Wayne County, where they were met by Dick Shumway of Sunray Mineral Products. The main purpose of this trip was to determine if the material Sunray Mineral Products wants to mine in Wayne County is coal or humate, similar to what is being mined in Emery County and regulated under UDOGM's Minerals program. Associated issues are whether the material Sunray Mineral Products wants to mine is properly covered by the SITLA clay lease or if a coal lease is needed, and whether the Sunray Mineral Products operation should be regulated under UDOGM's Minerals program or Coal program.

Emery County

The Rockland Corporation mine in Emery County, on property leased from SITLA, was the only active humate mining operation visited. Mining is done under a clay lease from SITLA and regulated by UDOGM's Minerals section.

A face-up several hundred feet long follows the humate deposit across the contour of the hill, with the mine portals located towards the eastern end. The stratigraphic section exposed along this cut is topped by a massive, cross-bedded sandstone. Towards the western end of this cut the sandstone is underlain by thin (< 1 foot), irregular bed of black, clean-appearing coal. The coal thins to the east and is not seen in the face-up at the portal area. Upper and lower contacts are abrupt. Under the coal is a section of mudstone and fissile shale that also thins to the east and is absent at the main portal. This shale and mudstone sequence grades downward into shaley, dirty coal that is exposed at the bottom of the cut and that continues east to the main portal. The shale and shaley coal contain gypsum crystals, and yellow stain is widespread throughout both rock types.

At the main portal the material being mined lies directly under the massive, cross-bedded sandstone. The mined sequence is roughly 8 feet thick; approximately 1 foot of shaley coal overlies approximately 1 foot of black, weathered coal that grades down into approximately 6 feet of carbonaceous shale. As in the exposures to the west, this sequence contains gypsum crystals and yellow stain.

A market exists for the humate for non-fuel uses. In the town of Emery, Rockland Corporation processes the humate into a soil amendment and an ingredient used in making dietary mineral supplements. It is the combination of organic and inorganic components that make the humate commercially valuable as a dietary supplement ingredient. Coal humates have been used to restore productivity to lands that have been damaged by spills of toxic

materials or overuse of chemical fertilizers or pesticides.

Two other sites on SITLA property in Emery County, on which persons hold clay or mineral leases, were visited: the Clark #1 and Cowboy Mines. There is no current mining activity but there is evidence of past mining, apparently for coal. Economic success of these operations is not known. There has been stabilization of waste piles with netting by the Utah AML program. At the Clark #1 property, the material exposed in the highwall is weathered carbonaceous shale and shaley coal similar to what is mined at the Rockland Mine.

Other active humate mines in the area, operated by T. J. Clark and other members of the Clark family, were not visited. These are located on BLM land and regulated under UDOGM's Minerals program. These have not been mined for coal as far as is known.

Wayne County

The Sunray Minerals Corporation clay lease is located 3 miles north of Factory Butte in the south half of the southwest quarter of Section 2, T. 27 S., T. 9 E. The clay soil in this area is derived from shale and sandstone of the Mancos Shale and is almost barren of vegetation. On much of the land between Factory Butte and the Sunray lease, humate or weathered coal is exposed at the surface. A humate exploration site on BLM land near the Sunray lease is permitted by UDOGM's Minerals program.

The pit for the Factory Butte coal mine was opened in the late 1970's on a tract of State land just north of the current Sunray lease. Permitting for the mine was done under the interim coal mining rules. The coal didn't meet quality stipulations of a contract with Nevada Power, and the coal mining operation went bankrupt. Reclamation was done by the State using forfeited bond monies. There was only enough money to remove the surface facilities outside the mine pit and reclaim the disturbed surface where they had been located. The pit remains unreclaimed, with spoil piles on the east and north sides. There is a 25 to 30 foot highwall on the west, but the lower part has been covered. The highwall along the south decreases in height updip, to the east, and has been partially covered.

Two seams were mined in the Factory Butte pit. The upper seam, still exposed in the west highwall, is dirty, carbonaceous coal or coaly shale, approximately 5 feet thick. This seam is overlain by approximately 5 feet of carbonaceous shale, which is under a cap of approximately 5 feet of cross-bedded sandstone. The lower seam, separated from the upper seam by roughly 10 feet of carbonaceous shale and lying approximately 25 feet below the surface, is reported to be a cleaner, higher quality coal. This lower seam has been covered, so it could not be examined. John Blake described the product rejected by Nevada Power as a blend of the two seams. Dip is approximately 5° to 10° to the west.

Dick Shumway initially obtained a coal lease of the entire southwest quarter-section

from SITLA with the intent of mining the humate in and around the pit, but UDOGM rejected his request for exemption from the coal mining rules: the SITLA coal lease allowed removal of the coal only, without the associated carboniferous shales, and the site had previously been permitted and operated, albeit unsuccessfully, as a coal mine. The coal lease was surrendered and a clay lease was obtained by Dick Shumway and a partner, Kenneth Westwood. Because of disagreements, Shumway and Westwood split the lease, Shumway taking the south half of the southwest quarter and Westwood taking the remainder of the lease, including the abandoned pit.

Dick Shumway and Sunray Minerals Corporation are no longer involved with the abandoned Factory Butte pit. SITLA recently ordered mining in the pit stopped because Westwood was taking, from the upper seam, what had previously been considered to be coal, rather than humate. The area in the pit where Westwood was mining the upper seam has been covered in compliance with a SITLA order.

The Sunray Mineral Products lease has no surface or subsurface disturbance: there are no exploration cuts but there are a few natural exposures. Judging from what can be seen in these exposures and in the abandoned pit, the material Dick Shumway intends to mine is the same as or very similar to the humate being mined in Emery County: weathered carbonaceous shale with yellow stain and gypsum crystals, and thin seams of weathered, dirty coal. There are no analysis reports of concentrations of humic and related acids. Results of three proximate analyses of coal from the pit, submitted to UDOGM by Sunray in 1997, indicate low Btu, low pH, and high sulfur, properties typical of humic shales and coals.

Dick Shumway's present intent is to mine the "upper seam" on the Sunray lease. There is also a "lower seam" of humate that is stratigraphically similar to the lower seam in the abandoned pit. Dick Shumway believes there is a fault between the pit and his property, so that the material he intends to mine is the same as the upper seam in the pit; however, the presence or absence of this fault and the stratigraphic relationship between the two areas are not critical factors.

CONCLUSIONS

The material that Sunray Mineral Products wants to mine in Wayne County is the same as or very similar to the humate mined in Emery County under permits from UDOGM's Minerals program.

Mining of this property under a clay lease from SITLA, rather than a coal lease, would be consistent with similar mining and exploration operations on SITLA and BLM lands in Emery and Wayne Counties.

The Sunray Mineral Products operation should be permitted under UDOGM's Minerals

program, rather than under the Coal program.

REFERENCES

Hoffman, G. K., Verploegh, J., and Barker, J. M., 1994, Geology and chemistry of humate deposits in the southern San Juan Basin, New Mexico, pre-print number 94-142, SME Annual Meeting, Albuquerque, New Mexico-February 14-17, 1994, 10 p.

Hoffman, G. K., Verploegh, J., and Barker, J. M., 1996, Geology and chemistry of humate deposits in the southern San Juan Basin, New Mexico, New Mexico Bureau of Mines and Mineral Resources Bulletin 154, Geology of Industrial Minerals 31st Forum, 1966, pp. 105-112.

Jackson, A. L., 1983, Humates and their development at Harley Dome, Utah, Grand Junction Geological Society-1983 Field Trip, pp. 17-19.

Siemers, C. T. And Wadell, J. S., 1977, Humate deposits of the Menefee Formation (upper Cretaceous), northern New Mexico, Supplement to the New Mexico Geological Society Guidebook, 28th Field Conference, San Juan Basin III, 21 p.

CC: John Blake, SITLA
Tony Gallegos, UDOGM
Dave Tabet, UGS
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United States Department of the Interior

GEOLOGICAL SURVEY
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In Reply Refer To:
EGS-214855
Mail Stop 915

Memorandum

To: Solicitor

Through: Assistant Secretary--Energy and Minerals

OCT 20 1977

From: Director, Geological Survey

Subject: Humate

The following information about humate is in response to the Associate Solicitor's memorandum, dated September 8, 1977, concerning whether humate should legally be construed as a mineral or vegetative material.

Humate is a naturally formed carbonaceous substance having a limited but definable range of chemical composition. It may not be homogeneous and lacks the restricted specific composition that is prerequisite for designation as a mineral species in the strict sense in which the latter is defined by the International Mineralogical Association. Humate, nonetheless, is mineral in the sense that this word is used in broad geological or mining contexts, as it is not created *de novo* by organisms, and results only by decomposition of such organisms or natural derivation from carbonaceous substances of whatever origin. A humate deposit consists of a naturally occurring brownish-black solid substance (humate) enclosed in rock. To obtain the humate, the rock must be mined and then subjected to chemical processes of extraction and refining to segregate the pure humate, similar to the mining and extraction of copper, uranium, phosphate, and other mineral commodities. In some instances, the rock containing the humate is simply mined, crushed, and screened to be used in an impure form, similar to the practice of producing raw phosphate rock to be used as a lower quality phosphate fertilizer.

Humate is very common and widespread. However, the term "humate deposit" should be used only if the humate has been naturally concentrated in rock close to the surface where it can be economically mined and produced. Currently known humate deposits have a limited distribution and are confined to small parts of only five or six States. If the demand for and thus the dollar value of raw or refined humate were to increase, lower grade humate deposits could be identified in five or six additional States.

Humate should not be considered coal, or a form of coal. The peculiar chemical solubility of humate, its natural geographic and geologic distribution, its geochemical history of formation, and the uses for which humate is mined clearly distinguish humate from coal. The following facts can help distinguish humate from coal:

a. By definition (*Glossary of Geology*, 1972, M. Gary, R. McAfee, Jr., and C. L. Wolf, eds., Amer. Geol. Institute, Washington, D.C., p. 339; *Humate in Coastal Sands of Northwest Florida*, 1965, V. E. Swanson and J. G. Palacas, U.S. Geol. Survey Bull. 1214-B, p. 15-16), the key chemical characteristic of humate is that humate is readily soluble in alkaline water; coal is not.

b. Humate is not mined for use as a combustible fuel; coal is. Humate is currently mined for use as a drilling-mud additive, as an organic base for soil conditioners of micronutrient fertilizers, and (rare) as a brown wood-stain or a binder for taconite ore.

c. Humate commonly occurs in geographic areas and in types of sedimentary rocks that do not contain coal beds, for example, the coastal plain sands of Florida and South Carolina. Humate can be irregularly disseminated in sandstone, in carbonaceous siltstone and shale, and in coal (especially weathered or oxidized low-rank coal such as lignite and subbituminous coal).

Humate cannot be considered a form of potash or phosphate. Neither potassium nor phosphorous is an essential constituent of humate; rather, they should be considered as impurities that, combined, make up less than 1 percent of natural humate. Humate can be extracted from a rock, however, and chemically treated by addition of soluble potassium and phosphate compounds to form a potash- and phosphate-rich organic soil additive.

The enclosed detailed definition and description of humate has been prepared for your use in considering other points regarding humate. Please advise us if we can be of further assistance in this matter.

U. E. McKelvey

Director

Enclosure

DEFINITION AND DESCRIPTION OF HUMATE

by

Vernon E. Swanson, U.S. Geological Survey, Denver, Colorado 80225

September 28, 1977

Humate is a class or group of natural carbonaceous (organic) substances that is characterized by its being readily soluble in slightly alkaline water; it commonly occurs as a brownish-black gel in peat, a solid brownish-black translucent material associated with low-rank coal (lignite or subbituminous), or a disseminated brownish-black cementing material in sediments, especially sandstone; humate includes materials variously termed dopplerite, leonardite, dakalite, hasemanite, humogelite, native humic acid, and similar types of natural organic substances.

The major-element composition of humate on a dry ash-free basis is generally 50 to 60 percent carbon, 3 to 5 percent hydrogen, 30 to 40 percent oxygen, 1 tc 3 percent nitrogen, and 1 to 3 percent sulfur. To be classified as humate, the organic substance is 85 or more percent soluble (exclusive of mineral matter) in a 0.1 N NaOH solution; to be calssified as a humate deposit, 25 or more percent of the rock should be soluble in a 0.1 N NaOH solution. The calorific value of humate is low, generally less than 2,220 Kcal/kg (4,000 Btu/lb), and it ignites with difficulty.

Humate is typically formed initially during, and as a product of, the processes of plant decay; or secondarily as a result of the slow natural oxidation of, especially, lignite or subbituminous coal. During the aerobic chemical and bacterial decomposition of plant material, or during the subsurface weathering (oxidation and the wetting and drying) of coal, some organic substances are converted into water-soluble colloidal form

(humic acid) which can be transported in natural waters or remain essentially in place, and are flocculated or precipitated from these waters to form humate. The flocculation or precipitation is a result of a natural change in the chemistry of the water, either a change to an acid state (pH generally less than 5) or a change on encountering water containing excess metal ions such as calcium, iron, or copper.

Humate and related terms have been used in the chemistry and soils literature for more than a century. As used in general chemistry and in soils chemistry, humate is defined as the salt or ester of humic acid that is soluble in alkaline solution but insoluble in acids or organic solvents. The term came into general use in geology in the 1960's, and has been applied to the natural (versus laboratory) concentration of alkaline-soluble organic substances in rocks; during processes of metamorphism or coalification, humate loses the solubility characteristic and the resulting material is simply identified as carbonaceous material, metahumate, or, questionably, the maceral vitrinite in coal. Depending on the major inorganic cation in humate, it is sometimes called, for example, calcium humate, sodium humate, or iron humate. Also, in its dissolved form (humic acid), humate has the ability to readily absorb and firmly retain metal ions such as uranium, copper, and zinc to as much as 10 percent by dry weight; this capacity to concentrate metals in economically important amounts makes humate of geologic interest in the exploration for metal deposits.

Several tens of thousands of tons of humate are mined annually, mainly leonardite in North Dakota, for use as a drilling-mud additive, as a base for soil conditioners or micronutrient fertilizers, or as an organic,

combustible binder for taconite-iron ore. Other past or proposed uses are as a cheap brown dye for any water-absorbing material, as a leach solution for secondary recovery of metal from ore dumps or tailings, and as an additive to acid mine water to remove toxic metals. The characteristics of value in these uses of humate are its water solubility and its hydrophylic and metal-sorptive properties.

Humate, as a class, is contrasted to another class of natural solid black-to-brown organic substances, bitumen, that is characterized by its petroleum-like composition and its solubility in organic solvents; bitumen includes materials variously termed gilsonite, wurtzilite, ingramite, impsonite, albertite, and related types of natural hydrocarbon substances.